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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/680,839	10/07/2003	Irena Maravic	080465	2991

23696 7590 12/23/2010
QUALCOMM INCORPORATED
5775 MOREHOUSE DR.
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EXAMINER	
PEREZ, JAMES M	

ART UNIT	PAPER NUMBER
2611	

NOTIFICATION DATE	DELIVERY MODE
12/23/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

us-docketing@qualcomm.com

Office Action Summary	**Application No.** 10/680,839	**Applicant(s)** MARAVIC ET AL.	
	Examiner JAMES M. PEREZ	**Art Unit** 2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 October 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-66* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-66* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

Detailed Action

This action is responsive to the Request for Continued Examination filed on 10/25/2010. Currently, claims 1-66 are pending (note claims 63-66 are newly added).

Response to Arguments

1. Applicant's arguments with respect to claims 1-62 and 64-66 have been considered but are moot in view of the new ground(s) of rejection as necessitated by the newly added limitations.

2. Applicant's arguments with respect to claim 63 have been fully considered but they are not persuasive for the following reasons:

(1) With regards to claims 63, Affes teaches a receiver, mobile station, and method for processing a signal sent over a wireless communication channel (abstract and paragraphs 14-23), comprising:

at least one antenna (fig. 1: elements 12.1 through 12.M); and

a receiver configured to receive a signal over a wireless communication channel (paragraphs 14-23), and sample the received signal with a sampling frequency (rate) lower than the sampling frequency given by the Shannon theorem (figs. 6 and 9: elements 18 and 23: paragraphs 119 and 138) for generating a set of sampled values (figs. 6 and 9: elements 18 and 23: paragraphs 119 and 138), wherein said sampling frequency is the chip rate (figs. 6 and 9: elements 18 and 23: paragraphs 119 and 138).

Affes does not explicitly teach determining the rate of innovation of said received signal and that the sampling rate is lower than the chip rate of said received signal, but greater than the rate of innovation of said received signal.

Unser teaches the reconstruction [of a consistent signal] is generally possible provided there are as many measurements (samples) as there are degrees of freedom in the signal (page 580: Section V, B. “Generalized Sampling”).

One of ordinary skill in the art at the time of the invention would recognize that since the rate of innovation is defined by the total degrees of freedom of the wanted signal (page 5, lines 27-29 of the instant specification) it would be obvious that Unser discloses sampling a signal at the rate of innovation for reconstruction in the digital domain. Furthermore, one of ordinary skill in the art at the time of the invention would recognize that the teachings of Unser (‘the reconstruction [of a consistent signal] is generally possible provided there are as many measurements [(i.e. samples)] as there are degrees of freedom in the signal’ (page 580: Section V, B. “Generalized Sampling”)) obviously determines the degrees of freedom (and thus determining the rate of innovation) in the received signal in order make/take “as many measurements [(i.e. samples)] as there are degrees of freedom in the [received] signal” (page 580: Section V, B. “Generalized Sampling").

Therefore, it would have been obvious to one of orindary skill in the art at the time of the invention that Affes in view of Unser discloses two useful sampling thresholds (useful in this case meaning that the reconstruction of the signal is possible): the first is being sampling at the chip rate, and the second being sampling at the rate of innovation.

Furthermore, the examiner holds that the advantages of optimizing a sampling frequency (rate) is well-known and expected in the art, where decreasing a sampling

rate has the advantage of decreasing processing speed and power dissipation of the processing elements, and increasing a sampling rate has known advantage of decreasing distortion due to aliasing. Therefore it would have been obvious to one of orindary skill in the art at the time of the invention to modify to the known sampling system of Affes in view of Unser to sample in between the known sampling thresholds since such a modification yields predictable results and benefits such as optimizing a sub-Nyquist sampling frequency in a CDMA (minimizing processing speed and power dissipation in relation to minimizing distortion due to aliasing).

(2) The following teaching references were previously cited to establish the knowledge generally available to one of ordinary skill in the art as cited below:

Pedersen et al. (US 2004/0057593) discloses under-sampling (below the Nyquist frequency) at least one received signal to yield the benefits of reducing the computational loading of a digital signal processor (DSP), even though under-sampling introduces distortion (due to aliasing) into the sampling signal (paragraph 81). Furthermore, an under-sampling factor is selected (having a value between 2 to 8, and thus the under-sampling rate is clearly adjustable) to optimize the sampling frequency (rate) (paragraph 81: optimizing the sampling frequency/rate being that the under-sampling rate is adjustable).

Haga et al. (USPN 6,507,603) discloses a CDMA communication system wherein the sampling rate is adapted (optimized) with reference to the channel condition (col. 4, lines 23-39 and col. 11, line 61 through col. 12, line 6). Specifically when the reception state (channel quality) is good the sampling rate is decreased in order to

reduce the operation speed of the processing elements thus reducing power consumption; and when reception state is poor the sampling rate is enlarged to improve precision (col. 4, lines 23-39 and col. 11, line 61 through col. 12, line 6). Wherein sampling at the chip frequency of a spread spectrum signal is discloses as being known in the art (col. 3, lines 7-13).

Pawelski (USPN 4,716,453) discloses that the sampling rate (bits per sample) is directly related to the quality of the received signal, efforts to balance (optimize) signal quality vs. cost (of the communication system) have led receivers to sample at sub-Nyquist sampling rates even though sampling at sub-Nyquist rates introduces distortion (such as aliasing) in the wanted signal (col. 1, lines 40-53 and col. 1, line 67 through col. 2, line 9).

Gardenhire et al. (USPN 3,478,266) discloses a receiver which uses under-sampling where <u>the benefits derived from the under-sampling are only valid if the sampling rate is sufficiently high that the distortion/interference produced by the aliasing effects are small</u> (col. 2, lines 36-46: thus increasing the sampling rate decreases interference from aliasing when perform under-sampling. Furthermore, under-sampling, performance, complexity, small aliasing effects, where all of these concepts and motivations where known by “another" at least as early as <u>Nov. 22nd 1966</u> (filing date of this patent)) (emphasis added).

McNeely (USPN 6,310,566) discloses, “[i]mportant objectives in sample rate converter design are: 1) <u>maximizing performance including minimizing alias (i.e. interference)</u> components in the Pass Band, and 2) <u>minimizing complexity</u> (e.g.

measured in the number of adders required for an implementation). Normally performance and complexity are inversely related in sample rate converter design" (col. 2, lines 60-66) (emphasis added) (thus McNeely clearly provides evidence that balancing/optimizing performance (i.e. minimizing aliasing interference) and complexity (e.g. cost, power consumption, etc) are well-known and expect in the art before the application effective filing date).

Nguyen (USPN 5,963,105) discloses many different types of oscillators (the devices used to generate clock signals) where all of these different oscillators frequency fluctuations/variations (col. 1, lines 15-63).

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. **Claims 1-62 and 64-66 are rejected under 35 U.S.C. 101 because the claimed invention is not supported by either a credible asserted utility or a well established utility for the following reasons:**

Independent claims 1, 28, 34, 61, 62, and 64-66 each contain a limitation direct to 'perfectly reconstructing the received signal (y(t)) using the set of sampled values ($y(nT_s)$)' (e.g. claim 1, lines 7 through 8). Pages 9-10 of the instant specification disclose that the received signal y(t) can be written as:

$$y(t) = \sum_{k=1}^{K} b_k \sum_{l=1}^{L} a_k^{(l)} s_k(t - \tau_k^{(l)})$$

where $\tau_k^{(l)}$ denotes the delay with respect to a reference at the receiver r of the signal transmitted by user k along the propagation path l, and $a_k^{(l)}$ denotes a complex amplitude attenuation induced by the

propagation path l that includes contributions from the attenuation of the transmission channel c and phase offset.

Thus in order to 'perfectly reconstruct the received signal using the set of sampled values' (i.e. absolutely no error) is only possible when the channel estimates/parameters ($a_k^{(l)}$ and $\tau_k^{(l)}$) are perfectly estimated (i.e. the estimation has no error). The specification further states that perfect estimation of the channel parameters ($a_k^{(l)}$ and $\tau_k^{(l)}$) only occurs "in the noiseless case" (paraphrased: instant specification (note the line numbers explicitly stated in the specification are used for reference): page 13, lines 3-6; page 13, lines 20-23; and page 18, lines 19-26) and in 'the case of noisy transmission, the propagation parameters ($a_k^{(l)}$ and $\tau_k^{(l)}$) cannot be estimated perfectly' (paraphrased: instant specification (note the line numbers explicitly stated in the specification are used for reference): page 18, lines 19-21).

Nash (USPN 4,771,438) discloses "how a modem receiver circuit responds to transmitted signals on an <u>ideal communication channel with no noise</u>" (col. 11, lines 35-37) (emphasis added) but <u>"[u]nfortunately, no ideal communication channels exist</u> [and thus] the effect of Gaussian <u>noise from the transmission path must be considered</u>" (col. 13, lines 18-22) (emphasis added).

One of ordinary skill in the art at the time of the invention would recognize that perfect reconstruction (due to the noiseless case) as claimed by the applicant is an ideal representation of the invention and thus the claimed invention lacks a credible asserted utility since a “noiseless case” (i.e. ideal communication channel) does not exist in the statutory categories defined by the provisions of 35 U.S.C. 101.

Furthermore, one of ordinary skill in the art at the time of the art that the claimed invention is not supported by a well established utility since perfect reconstruction, ideal communication channel, and a ‘noiseless case’ are not well established in the art of communication and/or sampling. Furthermore, the claimed invention is not supported by a specific, substantial, and credible utility (as explained above) and thus the claimed invention is not supported by a well-established utility (see MPEP 2107(II)(A)(3)).

Claims 1-62 and 64-66 are also rejected under 35 U.S.C. 112, first paragraph. Specifically, since the claimed invention is not supported by either a credible asserted utility or a well established utility for the reasons set forth above, one skilled in the art clearly would not know how to make and/or use the claimed invention.

5. **Claims 1-62 and 64-66 are rejected under 35 U.S.C. 101 because** the disclosed invention is inoperative and therefore lacks utility as explained below:

Independent claims 1, 28, 34, 61, 62, and 64-66 each contain a limitation direct to ‘perfectly reconstructing the received signal ($y(t)$) using the set of sampled values ($y(nT_s)$)’ (e.g. claim 1, lines 7 through 8). Pages 9-10 of the instant specification disclose that the received signal $y(t)$ can be written as:

$$y(t) = \sum_{k=1}^{K} b_k \sum_{l=1}^{L} a_k^{(l)} s_k(t - \tau_k^{(l)})$$

where $\tau_k^{(l)}$ denotes the delay with respect to a reference at the receiver r of the signal transmitted by user k along the propagation path l, and $a_k^{(l)}$ denotes a complex amplitude attenuation induced by the

propagation path l that includes contributions from the attenuation of the transmission channel c and phase offset.

Thus in order to 'perfectly reconstruct the received signal using the set of sampled values' (i.e. absolutely no error) is only possible when the channel estimates/parameters ($a_k^{(l)}$ and $\tau_k^{(l)}$) are perfectly estimated (i.e. the estimation of $a_k^{(l)}$ and $\tau_k^{(l)}$ has no error). The specification further states that perfect estimation of the channel parameters ($a_k^{(l)}$ and $\tau_k^{(l)}$) only occurs "in the noiseless case" (paraphrased: instant specification (note the line numbers explicitly stated in the specification are used for reference): page 13, lines 3-6; page 13, lines 20-23; and page 18, lines 19-26) and in 'the case of noisy transmission, the propagation parameters ($a_k^{(l)}$ and $\tau_k^{(l)}$) cannot be estimated perfectly' (paraphrased: instant specification (note the line numbers explicitly stated in the specification are used for reference): page 18, lines 19-21).

Nash (USPN 4,771,438) discloses "how a modem receiver circuit responds to transmitted signals on an <u>ideal communication channel with no noise</u>" (col. 11, lines 35-37) (emphasis added) but <u>"[u]nfortunately, no ideal communication channels exist</u> [and thus] the effect of Gaussian <u>noise from the transmission path must be considered</u>" (col. 13, lines 18-22) (emphasis added).

Therefore disclosed invention directed towards ‘perfectly reconstructing the received signal using the set of sampled values’ is inoperative and therefore lacks utility, since ‘ideal communication channels do not exist and noise must be considered’ (Nash: paraphrased: col. 13, lines 18-22) and applicant's specification has acknowledged that in the case of noisy transmission, ‘the propagation parameters ($a_k^{(l)}$ and $\tau_k^{(l)}$) cannot be estimated perfectly’ and thus the received signal (y(t)) cannot be ‘perfectly’ reconstructed.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 1-62 and 64-66 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Independent claims 1, 28, 34, 61, 62, and 64-66 each contain a limitation direct to ‘perfectly reconstructing the received signal (y(t)) using the set of sampled values ($y(nT_s)$)’ (e.g. claim 1, lines 7 through 8). Pages 9-10 of the instant specification disclose that the received signal y(t) can be written as:

$$y(t) = \sum_{k=1}^{K} b_k \sum_{l=1}^{L} a_k^{(l)} s_k(t - \tau_k^{(l)})$$

where $\tau_k^{(l)}$ denotes the delay with respect to a reference at the receiver r of the signal transmitted by user k along the propagation path l, and $a_k^{(l)}$ denotes a complex amplitude attenuation induced by the

propagation path l that includes contributions from the attenuation of the transmission channel c and phase offset.

Thus in order to 'perfectly reconstruct the received signal using the set of sampled values' (i.e. absolutely no error) is only possible when the channel estimates/parameters ($a_k^{(l)}$ and $\tau_k^{(l)}$) are perfectly estimated (i.e. the estimation has no error). The specification further states that perfect estimation of the channel parameters ($a_k^{(l)}$ and $\tau_k^{(l)}$) only occurs "in the noiseless case" (paraphrased: instant specification (note the line numbers explicitly stated in the specification are used for reference): page 13, lines 3-6; page 13, lines 20-23; and page 18, lines 19-26) and in 'the case of noisy transmission, the propagation parameters ($a_k^{(l)}$ and $\tau_k^{(l)}$) cannot be estimated perfectly' (paraphrased: instant specification (note the line numbers explicitly stated in the specification are used for reference): page 18, lines 19-21).

Nash (USPN 4,771,438) discloses "how a modem receiver circuit responds to transmitted signals on an <u>ideal communication channel with no noise</u>" (col. 11, lines 35-37) (emphasis added) but <u>"[u]nfortunately, no ideal communication channels exist</u> [and thus] the effect of Gaussian <u>noise from the transmission path must be considered</u>" (col. 13, lines 18-22) (emphasis added).

Therefore the claimed subject matter directed towards ‘perfectly reconstructing the received signal using the set of sampled values’ is not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention since ‘ideal communication channels do not exist and noise must be considered’ (Nash: paraphrased: col. 13, lines 18-22) and applicant's specification has acknowledged that in the case of noisy transmission ‘the propagation parameters ($a_k^{(l)}$ and $\tau_k^{(l)}$) cannot be estimated perfectly’ and thus the instant specification does not enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention which ‘perfectly reconstructs the received signal using the set of sampled values’.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claim 63 is rejected under 35 U.S.C. 103(a) as being unpatentable over Affes (US 2002/0051433) in view of Unser (“Sampling – 50 Years After Shannon”, Proceedings of the IEEE, Vol. 88, No.4: pages 569-587, April 2000).

With regards to claim 63, Affes teaches a receiver, mobile station, and method for processing a signal sent over a wireless communication channel (abstract and paragraphs 14-23), comprising:

at least one antenna (fig. 1: elements 12.1 through 12.M); and

a receiver configured to receive a signal over a wireless communication channel (paragraphs 14-23), and sample the received signal with a sampling frequency (rate) lower than the sampling frequency given by the Shannon theorem (figs. 6 and 9: elements 18 and 23: paragraphs 119 and 138) for generating a set of sampled values (figs. 6 and 9: elements 18 and 23: paragraphs 119 and 138), wherein said sampling frequency is the chip rate (figs. 6 and 9: elements 18 and 23: paragraphs 119 and 138).

Affes does not explicitly teach determining the rate of innovation of said received signal and that the sampling rate is lower than the chip rate of said received signal, but greater than the rate of innovation of said received signal.

Unser teaches the reconstruction [of a consistent signal] is generally possible provided there are as many measurements (samples) as there are degrees of freedom in the signal (page 580: Section V, B. “Generalized Sampling”).

One of ordinary skill in the art at the time of the invention would recognize that since the rate of innovation is defined by the total degrees of freedom of the wanted signal (page 5, lines 27-29 of the instant specification) it would be obvious that Unser discloses sampling a signal at the rate of innovation for reconstruction in the digital domain. Furthermore, one of ordinary skill in the art at the time of the invention would recognize that the teachings of Unser (‘the reconstruction [of a consistent signal] is

generally possible provided there are as many measurements [(i.e. samples)] as there are degrees of freedom in the signal' (page 580: Section V, B. "Generalized Sampling")) obviously determines the degrees of freedom (and thus determining the rate of innovation) in the received signal in order make/take "as many measurements [(i.e. samples)] as there are degrees of freedom in the [received] signal" (page 580: Section V, B. "Generalized Sampling").

Therefore, it would have been obvious to one of orindary skill in the art at the time of the invention that Affes in view of Unser discloses two useful sampling thresholds (useful in this case meaning that the reconstruction of the signal is possible): the first is being sampling at the chip rate, and the second being sampling at the rate of innovation.

Furthermore, the examiner holds that the advantages of optimizing a sampling frequency (rate) is well-known and expected in the art, where decreasing a sampling rate has the advantage of decreasing processing speed and power dissipation of the processing elements, and increasing a sampling rate has known advantage of decreasing distortion due to aliasing. Therefore it would have been obvious to one of orindary skill in the art at the time of the invention to modify to the known sampling system of Affes in view of Unser to sample in between the known sampling thresholds since such a modification yields predictable results and benefits such as optimizing a sub-Nyquist sampling frequency in a CDMA (minimizing processing speed and power dissipation in relation to minimizing distortion due to aliasing).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAMES M. PEREZ whose telephone number is (571)270-3231. The examiner can normally be reached on Monday through Friday: 10am to 6pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Payne can be reached on 571-272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/James M Perez/
Examiner, Art Unit 2611
12/18/2010

/David C. Payne/
Supervisory Patent Examiner, Art Unit 2611